

Molecular data support *Orianthera*: a new genus of Australian Loganiaceae

Charles SP Foster^{1,3}, Barry J Conn², Murray J Henwood¹ and Simon YW Ho¹

¹*School of Biological Sciences, University of Sydney, Sydney, NSW 2006, Australia*

²*National Herbarium of New South Wales, Mrs Macquaries Road, Sydney NSW 2000, Australia.*

³*Author for correspondence: charles.foster@sydney.edu.au*

Abstract

Results from recent molecular systematics have indicated that *Logania* R.Br. in its current circumscription is polyphyletic, with each of its two constituent sections, *Logania* sect. *Logania* and *L.* sect. *Stomandra*, representing distinct monophyletic clades. *Logania* sect. *Stomandra* is here raised to generic status as *Orianthera* C.S.P.Foster & B.J.Conn since the name *Stomandra* has already been applied to a genus in Rubiaceae. *Orianthera* differs from *Logania sensu stricto* based on the place of insertion of the stamens (in the sinus between the corolla lobes in *Orianthera*; in the middle of the corolla tube in *Logania*); the anthers being exerted from the corolla mouth in *Orianthera* (anthers included in *Logania*); the shape of the apex of each calyx lobe (acute to tapering, with membranous margin in *Orianthera*; obtuse in *Logania*, without membranous margin); and the sexuality of flowers (bisexual in *Orianthera*; unisexual in *Logania*). A key to genera in the tribe Loganieae is provided and 13 species (all new combinations) are enumerated for *Orianthera*.

Introduction

Logania R.Br. (Loganiaceae), first described by Robert Brown (1810, p. 454), is endemic to Australia following the recent transfer of the only extant non-Australian species, *L. imbricata* (Guillaumin) Steenis & Leenh. (Leenhouts and Steenis 1962, p. 440), to *Geniostoma* J.R.Forst. & G.Forst. (Forster and Forster 1776, p. 23) (Foster and Conn 2013). The genus comprises herbs, undershrubs, shrubs and small trees, and can be found in a range of habitats, both mesic and semi-arid (Conn 1994, 1995). As currently recognised, *Logania* consists of 35 species (Foster et al. 2014). When first published, the name *Logania* was illegitimate because Brown described *Logania* based on the type species of *Euosma* Andrews (Andrews 1808, p. 520). This began a long and complicated taxonomic history of the genus, although the name *Logania* was subsequently conserved (Greuter et al. 1988).

In describing the genus, Brown recognised two informal assemblages: ‘I [unnamed]’ and ‘II *Stomandra*’. He subdivided his group I into two subgroups, ‘A. *Logania verae*’ and ‘B. *Euosma*’. ‘A *Logania verae*’ contained five species, *L. crassifolia* R.Br., *L. elliptica* R.Br. [= *L. ovata* R.Br.], *L. latifolia* R.Br. [= *L. vaginalis* (Labill.) F.Muell.], *L. ovata* R.Br., and *L. longifolia* R.Br. [= *L. vaginalis*], whereas his ‘B. *Euosma*’ contained three species, *L. fasciculata* R.Br., *L. floribunda* R.Br. [= *L. albiflora* (Andrews and Jacks.) Druce] and *L. revoluta* R.Br. [= *L. albiflora*]. However, since he placed the type species, *L. floribunda*, within his subgroup ‘B. *Euosma*’, the name for group ‘A. *Logania verae*’ (= true *Logania*), was rendered invalid. Brown allocated three species to group ‘II *Stomandra*’: *L. serpyllifolia* R.Br., *L. pusilla* R.Br. and *L. campanulata* R.Br. Augustin de Candolle (1845) accepted Brown’s infrageneric concept and formally recognised the subgroups as sections by allocating

‘*A. Logania verae*’ and ‘*B. Euosma*’ to section *Eulogania* (= section *Logania*) and recognising the subgroup ‘*II Stomandra*’ as *L. sect. Stomandra* R.Br. ex DC. This sectional classification has been followed by subsequent authors (e.g. Bentham 1869; Conn 1994, 1995).

Despite the consistent recognition of the morphological differences between the two sections of *Logania*, a recent study using nucleotide sequence data indicated that *Logania* is polyphyletic (Fig. 1) (Foster et al. 2014). Maintaining *Logania* as currently circumscribed would require *Geniostoma* and *Mitreola* L. (Linnaeus 1758, p. 214) to be included in a more broadly defined *Logania* because of their phylogenetic placement (Foster et al., 2014). Due to the morphological synapomorphies that define each of these groups (Fig. 2), we consider the two sections of *Logania* to be best recognised as distinct genera. The sectional name, *Stomandra*, is unavailable as a generic name because it has previously been used in Rubiaceae as *Stomandra* Standl. (Standley 1947), now regarded as a synonym of *Rustia* (Standl.) Lorenze. Hence, we propose *Orianthera* as the new generic name for this clade (refer ‘Etymology’ below).

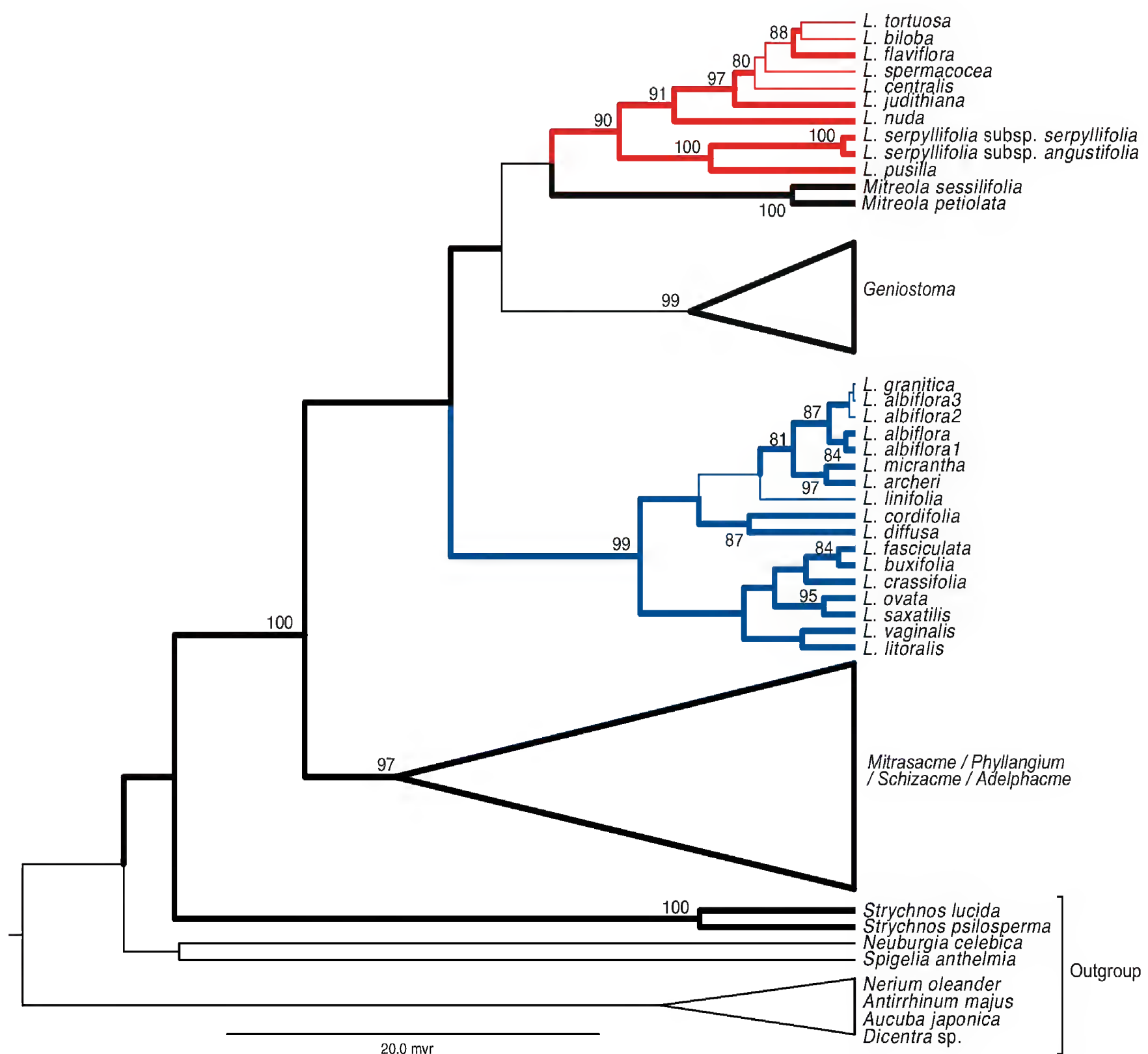


Fig. 1. Phylogenetic relationships of *Logania*. The maximum-clade-credibility tree, based on *petD* and *rps16* molecular markers, was obtained from a Bayesian phylogenetic analysis and is proportional to time. The abbreviation L. = *Logania*; red branches = *Logania* sect. *Stomandra* (here treated as *Orianthera*); blue branches = *Logania* sect. *Logania* (*Logania* s. str.). Bold branches have ≥ 0.95 posterior probability support, and nodes are labelled with support values when maximum-likelihood bootstrap percentages are $\geq 80\%$. Note that *Logania*, as currently classified, is polyphyletic, necessitating *L. sect. Stomandra* being recognised at genus level as *Orianthera*. Modified from Foster et al. (2014).

The necessary nomenclatural changes for transferring species of *Logania* sect. *Stomandra* DC. to the new genus *Orianthera* are made here. These changes are based on the strongly supported results of Bayesian, maximum-likelihood and maximum-parsimony analyses of the *petD* and *rps16* chloroplast molecular markers of 54 taxa representing the Loganieae ingroup, including 15 of the 22 *L.* sect. *Logania* species, and 10 of the 13 *L.* sect. *Stomandra* taxa, plus an additional eight outgroup taxa (Foster et al. 2014).

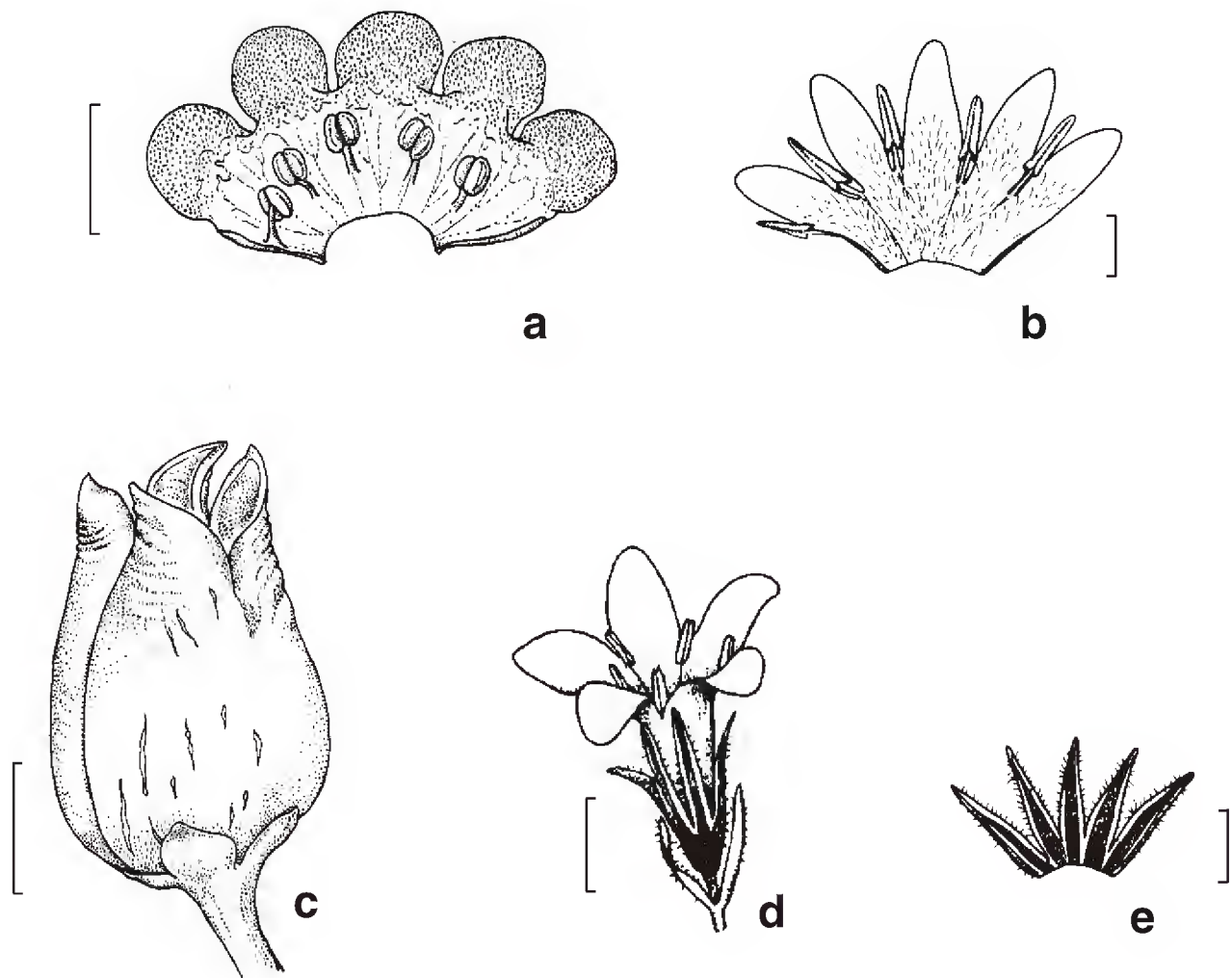


Fig. 2. The morphological characters used to distinguish between *Logania sensu stricto* and *Orianthera*. **a.** *Logania albiflora* showing open corolla, with included anthers and their insertion in the middle of the corolla tube, typical of *Logania sensu stricto*; **b.** *Orianthera nuda* showing open corolla, with exserted anthers inserted in the sinus between the corolla lobes, typical of *Orianthera*; **c.** *Logania vaginalis* fruiting capsule showing the obtuse or rounded calyx lobes, typical of *Logania sensu stricto*; **d.** *Orianthera biloba* flower showing prophylls, calyx, corolla and exserted stamens, particularly showing membranous margin of calyx lobes; **e.** *Orianthera spermacoea* showing open calyx with acute membranous lobes, typical of *Orianthera*. Scale bars = 5 mm. Illustrations: **a, c** sourced from fig. 1 (p. 642) and fig. 23 (p. 664) of Conn (1995) *Australian Systematic Botany* 8: 585–665 (originally drawn by Marion Westmacott, then NSW); **b, d, e** sourced from fig. 1 (p. 662) and fig. 4 (p. 678) of Conn (1994) *Telopea* 5: 657–692 (originally drawn by David Mackay, then NSW). All illustrations are reproduced with permission.

Morphological synapomorphies for *Logania* and *Orianthera*

Species of *Logania sensu stricto* and *Orianthera* differ by several morphological characters (illustrated in Fig. 2). The differences regarded as morphological synapomorphies of these two closely related genera are summarised in Table 1. Conn (1994) also summarised these morphological differences in his key to the sections of *Logania*, here treated as the genera *Logania* s.s. and *Orianthera*. Descriptions of the re-circumscribed genera *Logania* and *Orianthera* are presented below.

Table 1. Morphological synapomorphies of *Logania* and *Orianthera*

Character	<i>Logania</i>	<i>Orianthera</i>
Point of insertion of stamens	middle of corolla tube	mouth of corolla tube
Position of anthers relative to corolla	included	exserted
Shape of apex of calyx lobes	obtuse	acute; with lobes tapering
Margin of calyx lobes	not membranous	membranous
Flower sexuality	unisexual	bisexual

Taxonomic treatment

All taxa currently classified as belonging to *Logania* sect. *Stomandra* are here formally transferred to *Orianthera*, listed in alphabetical order (see below). All sister relationships noted below are based on the analysis of molecular data by Foster et al. (2014). The combinations of *O. callosa*, *O. campanulata*, *O. exilis* and *O. wendyae* are made solely on the basis of morphological data, but the presence of morphological synapomorphies supports their transfer to *Orianthera*. For a detailed discussion of morphology of *Orianthera* (as *Logania* sect. *Stomandra*) and *Logania* see Conn (1994, 1995), the studies on which our descriptions and definitions of morphological characters are based.

Orianthera C.S.P.Foster & B.J.Conn, *gen. nov.*

Logania sect. *Stomandra* R.Br. ex DC. *Prodromus* 9: 26 (1845). For typification and other literature refer Conn (1994).

Type: *Orianthera campanulata* (R.Br.) C.S.P.Foster & B.J.Conn, *comb. nov.*

Logania campanulata R.Br. *Prodromus* 456 (1810).

Diagnosis: *Orianthera* differs from *Logania sensu stricto* by having: the stamens inserted in the sinus between the corolla lobes (stamens inserted in the middle of the corolla tube in *Logania*); anthers exerted from the corolla mouth (anthers included in *Logania*); an acute to tapering calyx lobe apex, with margin membranous (obtuse in *Logania*, with margin not membranous); and by having bisexual flowers (unisexual in *Logania*).

Description: Herbs or small shrubs. Leaves opposite, sometimes greatly reduced and hence appearing bract- to scale-like, petiolate or sessile; stipules interpetiolar, membranous; margin entire. Inflorescences terminal, often appearing axillary when developing from short lateral shoots, monadic or appearing in 2–15-flowered variously reduced dichasial or modified botryoidal clusters. Flowers bisexual, hypogynous; calyx, corolla and androecium 5-merous; calyx deeply divided, with lobes acute to tapering at apex; margin membranous, ciliate; corolla sympetalous, campanulate, white or yellow; lobes imbricate in bud, spreading, entire, rounded to almost obtuse at apex; stamens inserted in or near sinus between corolla lobes and hence exerted beyond tube, but not exceeding corolla lobes in length; staminal filaments usually shorter than anther locules; anthers orbicular to narrowly obloid. Ovaries bicarpellate, syncarpellate, ovoid to subglobular, 2-loculate, with up to c. 10 ovules in each locule; styles robust (thick), included or exerted beyond the corolla tube; stigmas subglobose (capitate) or obloid, undivided or bilobed. Fruit a septicidal capsule, subglobose or ellipsoid, with two carpels almost completely separating from apex to base when dehiscent, with apex apiculate; valves coriaceous, usually black, woody; seeds \pm ellipsoid, brown, almost smooth to papillate; embryo cylindrical; endosperm starchy.

Distribution: *Orianthera* comprises 13 species, all endemic to Australia. All species are confined to southwestern Western Australia, with the exception of *O. pusilla* (which occurs only in eastern Australia), *O. centralis* (confined to drier regions of Western Australia and Northern Territory), and *O. nuda* (which occurs in the drier regions of Western Australia, South Australia, New South Wales and Victoria).

Nomenclatural note: Conn (1994) treated the authority of *L. sect. Stomandra* as '(R.Br.) DC.' However, he also acknowledged that "De Candolle is credited with formally recognising the '*Stomandra*' group (*sensu* Brown) as Section *Stomandra*." (Conn 1994, p. 659). Therefore, we conclude that Brown's informal group '*Logania II Stomandra*' should be regarded as only a taxonomic concept that was formalised by de Candolle (as '*Sectio II. Stomandra*').

Etymology: *Orianthera* is a conjugation of the Latin *os* (mouth) and *anthera* (anthers), and refers to the characteristic insertion of the anthers in the sinus between the corolla lobes of all species of this genus, and morphologically distinguishes it from *Logania s. str.* This generic name also preserves the meaning of the sectional name *Stomandra*.

1. *Orianthera biloba* (B.J.Conn) C.S.P.Foster & B.J.Conn, *comb. nov.*

Basionym: *Logania biloba* B.J.Conn *Telopea* 5: 663 (1994).

Type: AUSTRALIA. Western Australia: Irwin: 35 km by road (c. N) from turnoff to Kalbarri on the North West Coastal Highway, 25 Sep 1974, G. Perry 285 (holo: PERTH1657720 – lower specimen); iso: MEL, NSW, PERTH1657712, 1657720 (upper right specimen), 1657798, 1657801, 1657828.

Notes: This species is morphologically most similar in appearance to *O. flaviflora*, but differs in several floral characteristics. *Orianthera biloba* has a short stigma (1–1.3 mm long cf. (1.2–)1.6–3.4 mm long in *O. flaviflora*) that is deeply bilobed. *Orianthera biloba* generally has a shorter corolla than *O. flaviflora*. The inner surfaces of the corolla lobes are densely papillose in *O. biloba*, whereas in *O. flaviflora* they are sparsely to densely hairy basally, or sometimes the hairs are restricted to a narrow arching band. Molecular data demonstrated a sister relationship with *O. tortuosa*, but the latter is readily distinguished by its bract-like leaves (0.4–0.5 mm long) and tortuous branches (in *O. biloba* the leaves are 4.8–7.3 mm long and branches are straight).

2. *Orianthera callosa* (F. Muell.) C.S.P.Foster & B.J.Conn, **comb. nov.**

Basionym: *Logania callosa* F.Muell., *Fragmenta* 6(45): 134 (1868).

Lectotype (designated by Conn 1994): AUSTRALIA. Western Australia: ‘W.A.’ [‘In Australia occidentali’ (Protologue)], *Drummond s.n.* (MEL866).

Notes: The morphological similarity of *O. callosa* to the other species in this study suggests its placement in *Orianthera* is justified. *Orianthera callosa* is morphologically most similar to *Orianthera campanulata*. Both species have crinkly hairs near the base of the inner surface of the corolla lobes; however, in *O. callosa* these hairs are arranged in a narrow arching band (hairs not arranged in an arching band in *O. campanulata*). In *O. campanulata*, the outer surface of the corolla is sparsely to moderately hairy, whereas it is glabrous in *O. callosa* except for a few hairs on the margin at the base of the lobes. The inflorescences of *O. callosa* are usually 1-flowered, rarely 3-flowered (cf. (1 or)2–15-flowered inflorescences of *O. campanulata*). *Orianthera callosa* is usually a smaller plant than *O. campanulata*. Both species have the leaves crowded along the distal end of branches, but the internodes of *O. callosa* are usually not visible, whereas the internodes are usually visible in *O. campanulata*.

3. *Orianthera campanulata* (R.Br.) C.S.P.Foster & B.J.Conn, **comb. nov.**

Basionym: *Logania campanulata* R.Br. *Prodromus* 456 (1810).

Lectotype (designated by Conn 1994): AUSTRALIA. Western Australia: Darling: ‘King George III’s Sound’, [?19] Dec 1901, *R. Brown s.n.* [Bennett 2912] (BM – left specimen); isolecto: BM (central and upper right specimens).

Notes: This species is morphologically most similar to *Orianthera callosa*. *Orianthera campanulata* differs from *O. callosa* based on its larger size, the arrangement of its crinkled hairs in the corolla tube, its many-flowered inflorescences (cf. 1-flowered, rarely 3-flowered, inflorescences in *O. callosa*), and its visible internodes on branches (not easily visible in *O. callosa*).

4. *Orianthera centralis* (B.J.Conn) C.S.P.Foster & B.J.Conn, **comb. nov.**

Basionym: *Logania centralis* B.J.Conn *Telopea* 5: 674 (1994).

Type: AUSTRALIA. Northern Territory: Central South: *Approx. 10 km SE of Tarn of Auber, Mereenie oilfields*, 16 Oct 1984, *Latz 10008* (holo: PERTH1690434 – lower specimen); iso: CANB, DNA, PERTH1690434 (upper specimen).

Notes: *Orianthera centralis* is most similar in appearance to *O. nuda*. Both species are erect, compact undershrubs that have greatly reduced leaves, such that the plants appear leafless. The inflorescences are similar in both species, appearing to be axillary but occurring on short lateral axes. The corolla lobes are similar in shape and size for both species. However, *O. centralis* has moderately hairy branches (glabrous and minutely papillose in *O. nuda*), moderately hairy lamina with stiff bristle-like hairs (glabrous in *O. nuda*), a shorter pedicel (0.4–0.7 mm long in *O. centralis*, cf. 1–1.7 mm long in *O. nuda*), a slightly longer calyx (2–2.5 mm long in *O. centralis*, cf. 1.5–2 mm long for *O. nuda*), a shorter corolla (2.5–3 mm long in *O. centralis*, cf. (1.5–)4–5.5 mm long in *O. nuda*), and in particular a shorter corolla tube (1–1.5 mm long in *O. centralis*, cf. (1.5–)2.5–3.5 mm long in *O. nuda*). Molecular data suggest that *O. centralis* is nested within the majority of the Western Australian species of *Orianthera* and is sister to *O. spermacoea*, *O. flaviflora*, *O. biloba* and *O. tortuosa*.

5. *Orianthera exilis* (B.J.Conn) C.S.P.Foster & B.J.Conn, **comb. nov.**

Basionym: *Logania exilis* B.J.Conn *Telopea* 5: 685 (1994).

Type: AUSTRALIA. Western Australia: Roe: c. 95 km SE of Southern Cross, 14 March 1978, *George 15099*

(holo: PERTH1287028); iso: MEL, NSW274535.

Notes: This species is morphologically most similar to *O. judithiana*. However, *O. exilis* is less robust, with thinner branches (branches 1.1–1.5(–2.1) mm in diameter (average 1.4 mm), cf. branches (2–)2.5–3.8(–4) mm in diameter (average 3.1 mm) in *O. judithiana*). *Orianthera exilis* has shorter stipules (c. 0.3 mm long) than *O. judithiana* (0.6–0.8 mm long). The membranous margin of the calyx lobes of *O. exilis* are 0.1–0.2 mm wide, whereas they are c. 5 mm wide in *O. judithiana*.

6. *Orianthera flaviflora* (F.Muell.) C.S.P.Foster & B.J.Conn, *comb. nov.*

Basionym: *Logania flaviflora* F.Muell. *Victorian Naturalist* 5: 175 (1889).

Lectotype (designated by Conn 1994): AUSTRALIA. Western Australia: Darling: ‘Sources of Swan River’, *anno* 1888, *Merrall s.n.*, (MEL501227 – lower right specimen); isolecto: MEL501227 (upper and left specimen).

Notes: This species is most similar in appearance to *O. biloba* (see notes for *O. biloba* above), and molecular data suggest that *O. flaviflora* is sister to *O. biloba* and *O. tortuosa*.

7. *Orianthera judithiana* (B.J.Conn) C.S.P.Foster & B.J.Conn, *comb. nov.*

Basionym: *Logania judithiana* B.J.Conn *Telopea* 5: 683 (1994).

Type: AUSTRALIA. Western Australia: Roe: 39.5 km E of Hyden on the Hyden – Norseman Road, 3 Oct 1989, *Conn 3307 & Scott* (holo: NSW225532); iso: AD, MEL, PERTH, RSA.

Notes: *Orianthera judithiana* is morphologically most similar to *O. exilis*, with some similarities to *O. tortuosa* (see notes for *O. exilis* and *O. tortuosa*). Molecular data indicate a sister relationship to *O. biloba*, *O. centralis*, *O. flaviflora*, *O. spermacoceae* and *O. tortuosa*.

8. *Orianthera nuda* (F.Muell.) C.S.P.Foster & B.J.Conn, *comb. nov.*

Basionym: *Logania nuda* F.Muell. *Fragmenta* 1: 131 (1868).

Lectotype (designated by Conn 1994): AUSTRALIA. New South Wales: South Far Western Plains: ‘sand ridge, Kulkyne’ (in Dallachy’s hand), ‘In collibus arenosis prope Kulkyne ad flumen Murray’ – quotation from protologue (not in Dallachy’s hand), [1858 (not in Dallachy’s hand)], *Dallachy s.n.* (MEL501233 – left specimen); isolecto: MEL501233 (right hand specimen).

Notes: *Orianthera nuda* is morphologically most similar to *O. centralis* (see notes section below *O. centralis*). With the exception of *O. serpyllifolia*, *O. nuda* is sister to all Western Australian species sampled (Foster et al. 2014).

9. *Orianthera pusilla* (R.Br.) C.S.P.Foster & B.J.Conn, *comb. nov.*

Basionym: *Logania pusilla* R.Br. *Prodromus* 456 (1810).

Lectotype (designated by Conn 1994): AUSTRALIA. New South Wales: Central Coast: Port Jackson, *R. Brown s.n.* [Bennett 2911], (BM – lower left specimen); isolecto: BM (lower centre and right specimens, all except for left specimen); MEL501234.

Notes: Molecular data support a sister relationship between *O. pusilla* and *O. serpyllifolia*, which is congruent with the close morphological similarity described by Conn (1994). The two species can be distinguished by several morphological features. *Orianthera pusilla* is glabrous, whereas *O. serpyllifolia* is rarely glabrous, instead usually being sparsely to moderately hairy. The leaves of *O. pusilla* are petiolate, with petiole 1–3 mm long, whereas the leaves of *O. serpyllifolia* are subsessile to shortly petiolate (petiole 0.1–0.8 mm long in *O. serpyllifolia* subsp. *serpyllifolia*, (0.2–)0.5–2.5 mm long in *O. serpyllifolia* subsp. *angustifolia*). In *O. pusilla* the leaf lamina is narrowly elliptic to narrowly ovate or oblong, whereas the lamina of *O. serpyllifolia* is variously ovate. The corolla tube of *O. pusilla* is 3–4.8 mm long, whereas in *O. serpyllifolia* it is only 1.6–2.9 mm long. In *O. pusilla* the ovary and style are glabrous, whereas in *O. serpyllifolia* the style and ovary are sparsely to moderately covered in glandular hairs.

10. *Orianthera serpyllifolia* (R.Br.) C.S.P.Foster & B.J.Conn, *comb. nov.*

Basionym: *Logania serpyllifolia* R.Br. *Prodromus* 456 (1810).

Lectotype (designated by Conn 1994): AUSTRALIA. Western Australia: ‘King George’s III Sound’, *anno* 1802–5, *Brown s.n.* (BM); isolecto: MEL501235.

Notes: Molecular data support a sister relationship between *O. serpyllifolia* and *O. pusilla*. This is congruent with the morphological similarity described by Conn (1994) (see notes for *O. pusilla*). *Orianthera serpyllifolia* is also similar in appearance to *O. wendyae* (see notes for *O. wendyae* below and Cranfield and Keighery 2006).

10a. *Orianthera serpyllifolia* (R.Br.) C.S.P.Foster & B.J.Conn subsp. *serpyllifolia*,

Logania serpyllifolia R.Br. subsp. *serpyllifolia*

10b. *Orianthera serpyllifolia* subsp. *angustifolia* (Benth.) C.S.P.Foster & B.J.Conn, *comb. nov.*

Basionym: *Logania serpyllifolia* R.Br. subsp. *angustifolia* (Benth.) B.J.Conn *Telopea* 5: 674 (1994).

Lectotype (designated by Conn 1994): AUSTRALIA. Western Australia: Cape Leschenault, North of Bunbury, Oldfield 329 (MEL501239).

11. *Orianthera spermacoea* (F.Muell.) C.S.P.Foster & B.J.Conn, *comb. nov.*

Basionym: *Logania spermacoea* F.Muell. *Fragmenta* 6: 134 (1868).

Lectotype (designated by Conn 1994): AUSTRALIA. Western Australia: Irwin: Champion Bay, [Walcott &] Oldfield s.n. (MEL501241 – lower left specimen); isolecto: MEL501241 (upper two, lower centre and lower right specimens), MEL501242.

Notes: This species is most similar in appearance to *O. biloba* and *O. flaviflora*. All three species have distinct leaves and branches that are more or less terete with many longitudinal furrows. *Orianthera spermacoea* can be distinguished from the latter two species by having long, patent spreading hairs on the branches (hairs 0.1–0.5(–0.8) mm long), compared to the short, antrorse to retrorse hairs of *O. biloba* and *O. flaviflora* (hairs <0.1(–0.2) mm long). *Orianthera spermacoea* can be distinguished from the latter two species by its white corolla, whereas the corolla is yellow in both *O. flaviflora* and *O. biloba*. Molecular data support *O. spermacoea* as being sister to *O. flaviflora*, *O. biloba* and *O. tortuosa*.

12. *Orianthera tortuosa* (Herbert) C.S.P.Foster & B.J.Conn, *comb. nov.*

Basionym: *Logania tortuosa* Herbert *Journal of the Royal Society of Western Australia* 8: 38 (1922).

Lectotype (designated by Conn 1994): AUSTRALIA. Western Australia: Darling: Yoting, Herbert & Wilson 162, Nov 1920 (MEL501246); isolecto: Wilson & Herbert [Herbert & Wilson] s.n. [162] (PERTH1599402).

Notes: *Orianthera tortuosa* is most similar in appearance to *Orianthera judithiana*, but these two species can be readily distinguished by several morphological characters. The branches of *O. tortuosa* are irregularly turned to almost curled (tortuous), but *O. judithiana* has more or less erect, straight branches. The leaf lamina in *O. tortuosa* is 0.9–1.5 mm long, whereas those of *O. judithiana* are slightly longer (1.5–2 mm long). The inflorescence is metaxymonadic (1-flowered) in *O. tortuosa*, but dichasial and 3–7-flowered in *O. judithiana*. The smaller flowers (calyx 2.2–3 mm long, corolla 5–8(–9) mm long) are pleasantly aromatic in *O. tortuosa*, whereas the larger flowers (calyx 4.5–5 mm long, corolla (10–)12–16(–18) mm long) of *O. judithiana* are strongly and unpleasantly aromatic. However, despite the close morphological affinity, molecular data indicate that *O. tortuosa* is sister to *O. biloba*.

13. *Orianthera wendyae* (Cranfield & Keighery) C.S.P.Foster & B.J.Conn, *comb. nov.*

Basionym: *Logania wendyae* Cranfield & Keighery *Nuytsia* 16: 11 & 12 (2006).

Type: (Cranfield and Keighery 2006) AUSTRALIA. Western Australia: Dardanup forest block, 30 Oct 1996, G.J. Keighery 15011 (holo.: PERTH5121906 n.v.)

Notes: This species is morphologically most similar to *O. serpyllifolia* subsp. *angustifolia*. Cranfield and Keighery (2006) proposed the following characteristics to distinguish between these two taxa: (1) *Orianthera wendyae* has long white hairs that mask the leaves (cf. sparsely hairy leaves of *O. serpyllifolia* subsp. *angustifolia*), and (2) “many of the [herbarium] specimens of *L. serpyllifolia* subspecies *angustifolia* examined have darkened almost to black, a feature common in *Logania* [here *sensu lato*]” (Cranfield and Keighery 2006, p. 12); a feature they have not observed in *O. wendyae* specimens. The taxonomic importance of the second feature is uncertain because it may be an artefact of the drying process of plant specimens. Furthermore, this change in colour occurs during the drying of many groups of plants, for example frequently in *Geniostoma* (Loganiaceae – B.J. Conn pers. obs.), also refer Nelson and Falshaw (1999). Since *O. wendyae* is known from only three collections across a small area, and *O. serpyllifolia* subsp. *angustifolia* is known to be phenotypically variable across its distribution (Conn 1994), *O. wendyae* may be more usefully treated as part of this variation. However, in the

absence of molecular data this taxon is maintained as a distinct species and is transferred to *Orianthera*.

Logania* R.Br. *sensu stricto

Logania R.Br. section *Logania*: DC. *Prodromus* 9: 26 ([January] 1845)(as ‘*Sectio I. Eulogania*’); ‘§. 2. *Euosma*’ Nees in Lehmann *Plantae Preissianae* 1: 367 ([August] 1845);

[*Logania*] ‘*I Fructicosæ*’ [subgroup] ‘*B. Euosma*’ *sensu* R.Br. *Prodromus* 456 (1810). Based on *Euosma albiflora* Andrews & Jacks. [= *Logania albiflora* (Andrews & Jacks.) Druce] (as ‘*L. floribunda*’ R.Br. (1810, p. 456) [*nom. illeg.*]); [*Logania*] ‘*I Fructicosæ*’ [subgroup] ‘*A. Logania vera*’, *sensu* R.Br. *Prodromus* 455 (1810); Nees in Lehmann *Plantae Preissianae* 1: 366 ([August] 1845)(as ‘& 1. *Logania vera*’). Based on *Logania crassifolia*, *L. latifolia* [= *L. vaginalis*], *L. ovata* and *L. elliptica* [= *L. ovata*].

Type: *Logania albiflora* (Andrews & Jacks.) Druce (*typ. cons.*).

Description: Undershrubs, shrubs or small trees, dioecious. Leaves opposite, sessile, subsessile to petiolate; lamina narrow to broad, with margin entire; stipules interpetiolar, membranous. Inflorescence terminal, often appearing axillary when developing from short lateral shoots, variously cymose (botryoidal, metabotryoidal, thyrsoidal or paniculate), variously reduced or elaborated, 1–many-flowered. Flowers usually small, unisexual, hypogynous; calyx, corolla and androecium 5-merous. Calyx deeply divided, with lobes obtuse; ciliate. Corolla sympetalous, campanulate, white; lobes imbricate in bud, spreading, entire, rounded to almost obtuse at apex. Stamens inserted about halfway up corolla tube, included; staminal filaments much shorter or up to as long as anther locules; anthers orbicular to narrowly obloid. Ovary bicarpellate, syncarpellate, ovoid to subglobular, 2-loculate, 1 to at least 10 ovules in each locule; style robust (thick), much shorter in female flowers compared to male flowers, included or exserted beyond the corolla tube; stigma large, ovoid to subglobular (capitate) in female flowers, variously reduced but particularly narrower and obloid in male flowers, undivided or bilobed. Fruit a septicidal capsule, subglobose or ellipsoid, with two carpels almost completely separating from apex to base when dehiscent, with apex apiculate; valves coriaceous, usually black, woody; seeds ± ellipsoid, brown, with surface ‘honey-combed’ (when dried); embryo cylindrical; endosperm starchy.

Key to the genera of tribe Loganieae (Loganiaceae)¹

1. Herbs or undershrubs 2
- 1: Shrubs, trees or woody climbers 8
2. Capsule without horns, not bilobed; Australia (not Tasmania), doubtfully New Zealand (extinct) 3
- 2: Capsule two-horned (horns occasionally adherent along almost their entire length, appearing continuous with base of styles) or bilobed 4
3. Stamens inserted in middle of corolla tube, anthers included in corolla tube; apex of calyx lobes obtuse; flowers unisexual ***Logania***
- 3: Stamens inserted in mouth of corolla tube, anthers exserted from corolla tube; apex of calyx lobes acute; flowers bisexual ***Orianthera***
4. Calyx, corolla and androecium 4-merous, or calyx absent 5
- 4: Calyx, corolla and androecium 5-merous 7
5. Calyx absent; corolla and capsule enclosed in a two-lobed foliaceous involucre; ovary semi-inferior; southern Australia (including Tasmania) ***Phyllangium***
- 5: Calyx present, involucre absent; ovary superior..... 6
6. Calyx tube indistinct, up to 1 mm long; calyx lobes generally unequal; capsule laterally compressed, appearing broadly cuneiform in lateral view; placenta elongate, seeds few; Australia (Tasmania and alpine Victoria) and New Zealand² ***Schizacme***
- 6: Calyx tube distinct; calyx lobes equal; capsule generally globular, ovoid or ellipsoid; placenta hemispherical, seeds many; Southeast and East Asia, New Guinea, northern and eastern Australia (including Tasmania), New Caledonia ***Mitrasacme***

7. Leaves < 4 mm long; stipules arranged as a persistent membranous interfoliar sheath; corolla mouth glabrous or papillose; styles retained in fruit, connate at their apices (sometimes separating post-maturity); south-western Australia ***Adelphacme***
- 7: Leaves at least 10 mm long (except *M. sessilifolia* (J.F.Gmel.) G.Don ≥ 6 mm long and *M. petiolatoides* P.T.Li ≥ 5 mm long); stipules well-developed (mostly triangular) or reduced to a stipular line; corolla mouth with penicillate ring of hairs; styles not persisting in fruit or stigmas free, subsessile; Americas, Africa, Madagascar, Southeast and East Asia, New Guinea, northern Australia ***Mitreola***
8. Placenta fleshy, yellow to red (contrasting with colour of capsule), with seeds embedded; Mascarene Islands, Malesia, north-eastern Australia and Pacific ***Geniostoma***
- 8: Placenta dry, green to pale brown (similar to colour of capsule), with seeds not embedded; Australia (not Tasmania), doubtfully New Zealand (extinct) 9
- 9 Dioecious shrubs to trees or woody climbers; calyx obtuse; stamens inserted in middle of corolla tube, with anthers included within tube ***Logania***
- 9: Hermaphroditic undershrubs to shrubs, never trees or climbers; calyx lobes tapering, acute; stamens inserted in or near sinus between corolla tube, with anthers exerted beyond tube ***Orianthera***

¹Modified from Gibbons et al. (2013)

²Species congeneric with *Schizacme* are currently recognised under the name *Mitrasacme* in New Zealand (Gibbons pers. comm. July 2014).

Acknowledgments

We thank the curators of NSW and SYD for access to their Loganiaceae collections. We also thank the Royal Botanic Gardens and Domain Trust, Sydney (New South Wales) for permission to reproduce parts of the botanical illustrations of Marion Westmacott (Katoomba, N.S.W.) and David Mackay (University of New England, Armidale, N.S.W.). This project was supported in part by the Hansjörg Eichler Scientific Research Fund (Australasian Systematic Botany Society).

References

- Andrews H (1808) ‘The botanist’s repository.’ (Bensley: London)
- Bentham G (1869) ‘Flora Australiensis: a description of the plants of the Australian Territory.’ (Reeve & Co.: London)
- Brown R (1810) ‘Prodromus florae novae hollandiae.’ (J. Johnson & Co.: London)
- Candolle A de (1845) ‘Prodromus systematis naturalis regni vegetabilis.’ (Fortin, Masson & Sociorum: Paris)
- Conn BJ (1994) Revision of *Logania* R.Br. section *Stomandra* (R.Br.) DC (Loganiaceae). *Telopea* 5: 657–692 <http://dx.doi.org/http://dx.doi.org/10.7751/telopea19944994>
- Conn BJ (1995) Taxonomic revision of *Logania* section *Logania* (Loganiaceae). *Australian Systematic Botany* 8: 585–665 <http://dx.doi.org/http://dx.doi.org/10.1071/SB9950585>
- Cranfield R, Keighery G (2006) *Logania wendyae* (Loganiaceae), a new species from south-west Western Australia. *Nuytsia* 16: 11–14
- Forster JR, Forster JGA (1776) ‘Characteres Generum Plantarum: quas in itinere ad insulas maris Australis, collegerunt, descripserunt, delineant, annis 1772–1775.’ 2 edn. (B. White, T. Cadell and P. Elmsley: London)
- Foster CSP, Conn BJ (2013) Status of *Logania imbricata* (Guillaumin) Steenis & Leenh. (Loganiaceae). *Telopea* 15: 1–4 <http://dx.doi.org/http://dx.doi.org/10.7751/telopea2013001>
- Foster CSP, Ho SYW, Conn BJ, Henwood MJ (2014) Molecular systematics and biogeography of *Logania* R.Br. (Loganiaceae). *Molecular Phylogenetics and Evolution* 78: 324–333 <http://dx.doi.org/http://dx.doi.org/10.1016/j.ympev.2014.06.001>
- Gibbons KL, Conn BJ, Henwood MJ (2013) *Adelphacme* (Loganiaceae), a new genus from south-western Australia. *Telopea* 15: 37–43 <http://dx.doi.org/http://dx.doi.org/10.7751/telopea2013005>
- Greuter W, Burdet H, Chaloner W, Demoulin V, Nicolson D, Silva P (1988) International Code of Botanical Nomenclature (Berlin Code). *Regnum Vegetabile* 118
- Leenhouts P, Steenis C, van (1962) Reduction of the genus *Nautophylla* Guillaumin to *Logania* R.Br. *Bulletin du Jardin botanique de l’État à Bruxelles* 32: 439–440

- Linnaeus C (1758) ‘Opera Varia in quibus continentur Fundamenta Botanica, Sponsalia Plantarum, et Systema Naturae, in quo proponuntur naturae regna tria secundum classes, ordines, genera et species.’ (Typographia Juntiniana: Lucae)
- Nelson WA, Falshaw R (1999) Irreversible deterioration of some carrageenophytes (Rhodophyta) in herbaria. *Taxon* 48: 325–329 <http://dx.doi.org/10.2307/1224437>
- Standley PC (1947) *Stomandra*. Studies on Central American plants - VII. *Publications of the Field Museum of Natural History. Botanical series*. 23: 247–248

Manuscript received 20 August 2014, accepted 15 October 2014